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FAMILY LYCEUM.

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BIOGRAPHY.

[Concluded from the last Lyceum.]

ALFRED.

WE have hitherto viewed this prince as a warrior only; in which character he certainly rivals any of those whose names have been immortalized for their warlike achievements. It is now time to notice his gentler virtues, and take a view of him in a less striking, though not a less pleasing light; as a just, learned, and religious king; a lover of his country; and an indefatigable promoter of arts, sciences, justice, and religion. Among other exertions for the welfare of his subjects, he collected a body of laws, with the greatest judgment, from the Sacred Scriptures; from those of Ina, Offa, and Ethelbert, the greatest lawgivers from the Saxon kings; as well as from the usages of the various nations that inhabited Britain. He is likewise supposed by some historians to have ingrafted into his system, some of the laws of the Trojans and Grecians, which he translated himself for that purpose. But as laws, however good in themselves, will be ineffectual to answer the salutary purposes for which they are enacted, unless they are properly enforced, Alfred caused his to be observed with the greatest rigor; and he is said to have ordered four and forty judges to be executed within the compass of one year, for not doing justice.

These wise institutions had such a wonderful effect, and produced so sudden and extraordinary a change throughout the kingdom, that instead of murder and rapine which had so long prevailed, there was neither robbery, breach of peace, public offence, nor private injury, to be heard of. When the king, to make trial of the honesty of his people, caused gold bracelets to be hung up in the highway, no one ventured to take them down; virgins might then travel safely alone, nor fear the insults of any rude libertine; and if a purse of money were dropped on the road, it was suffered to be there for months together, till taken up by the real proprietor.

Many were the improvements Alfred made in his army and navy. By his attention to the latter, he laid the foundation of that superiority at sea which England has hitherto been able to maintain over all the other maritime powers; and to the encouragement he gave to navigation, with the unwearied pains he took to discover remote countries, is to be attributed, in a great measure, the present extensiveness of our commerce.

To enumerate all the beneficial and illustrious acts of this great prince, would exceed our limits. Suffice it to say, that after he had restored peace and regularity to his people, provided for their future defence, and endeavored to introduce riches and plenty among them, by the encouragement he gave to trade and commerce, he turned his thoughts to the cultivation of the arts, and the restoration of letters. For this purpose he invited over, and by his great liberality and condescension, secured to himself such learned men as had rendered themselves conspicuous in other nations; reformed his clergy, built religious houses, founded schools, particularly the university of Oxford, and erected or embellished many towns and cities. Nor was his private character less worthy of being recorded, than his noble actions and beneficial ordinances. Independent of his regal qualities, in his private life he was the most amiable person this island ever produced. His form was unexceptionable, his mien graceful, and his address easy and genteel. In conversation he was agreeable and instructive; but when he harangued his army, or endeavored to excite the indignation of his nobles against their infidel invaders, the energy and fire of Demosthenes gave weight to his arguments, and rendered them irresistibly persuasive.

His affability gained him the love of his subjects; but at the same time he knew how to condescend without sinking below his dignity, and how to endear himself to them without lessening their veneration. He never immoderately indulged himself in the luxuries of the table; on the contrary, he was uncommonly moderate in his diet, and restrained all his desires within proper bounds. His charities were more than proportioned to his revenues, and were so much the more praiseworthy, as they were done without the least ostentation.

After a troublesome reign of twenty-eight years, he died on the 28th of October, A. D. 900; and was buried at Winchester in Hyde abbey, under a monument of porphyry.

All our historians agree in distinguishing him as one of the most valiant, wisest and best of kings, that ever reigned in England; and it is also generally allowed that he not only digested several particular laws still in being, but that he laid the first foundation of our present happy constitution. There is great reason to believe, that we are indebted to this prince for trials by juries, and the Doomsday book, which is preserved in the exchequer, is thought to be no more than another edition of Alfred's Book of Winchester, which contained a survey of the kingdom. It is said also, that he was the first who divided the kingdom into shires; what is ascribed to him is not a bare division of the country, but the settling a new form of judicature; for after having divided his dominions into shires, he subdivided each shire into three parts called tythings. There are some remains of this ancient division in the ridings of Yorkshire, the laths of Kent, and the three parts of Lincolnshire. Each tything was divided into hundreds or wapentakes; and these again into tythings or dwellings of ten householders; each of these householders stood engaged to the king as a pledge for the good behaviour of his family, and all the ten were mutually pledges for each other; so that if any one of the tythings was suspected of an offence, if the headboroughs, or chiefs of the tythings, would not be security for him, he was imprisoned; and if he made his escape, the tything and hundred were fined to the king. Each shire was under the government of an earl, under whom was the reive his deputy; since from his office called shire-reive, or sheriff. Alfred was a remarkable economist of his time; and Asserius has given us an account of the method he took for dividing and keeping an account of it; he caused six wax candles to be made, each of twelve inches long, and of as many ounces weight; on the candles the inches were regularly marked, and having found that one of them burnt just four hours, he committed them to the care of the keepers of his chapel, who from time to time gave him notice how the hours spent; but as in windy weather the candles were wasted by the impression of the air on the flame, to remedy this inconvenience he invented lanthorns, there being then no glass in his dominions. This prince we are told was twelve years of age before a master could be procured in the western kingdom to teach him the alphabet; such was the state of learning when Alfred began to reign. He had felt the misery of ignorance; and resolved even to rival his contemporary Charlemagne in the encouragement of literature. He is supposed to have appointed persons to read lectures at Oxford, and is therefore considered as the founder of that university. By other proper establishments, and by a general encouragement to men of abilities, he did every thing in his power to diffuse knowledge throughout his dominions. Nor was this end promoted more by his countenance and encouragement, than by his own example and his writings. For notwithstanding the lateness of his initiation, he had acquired extraordinary erudition; and if indeed he had not been illustrious as a king, he would have been famous as an author. The literary works of Alfred were numerous, consisting of original compositions and translations; he devoted so much time to his studies, that he at length became the most acute scholar of the age he lived in; he was a grammarian, a rhetorician, a philosopher, an historian, the prince of Saxon poesy, a musician, a geometrician, and an excellent architect.

The following is a list of the writings of this great monarch:

1. Breviarum quoddam collectum ex Legibus Trojanorum, &c., lib. i. A breviary collection out of the Laws of the Trojans, Greeks, Britons, Saxons, and Danes, in one book. Leland saw this work in the Saxon tongue, at Christchurch in Hampshire. 2. Visi Saxonum Leges, lib. i. The Laws of the West Saxons, in one book. Pitts tells us, that it is in Bennet College Library, at Cambridge. 3. Instituta quædam, lib. i. Certain Institutes, in one book. This is mentioned by Pitts, and seems to be the second capitulation with Guthrum. 4. Contra judices iniquos, lib. i. An invective against unjust judges, in one book. 5. Acta Magistratuum suorum, lib. i. Acts of his Magistrates, in one book. This is supposed to be the book of judgments mentioned by Home; and was, in all probability, a series of reports, intended for succeeding ages. 6. Regum fortunæ variæ, lib. i. The various fortunes of Kings, in one book. 7. Dicta Sapientum, lib. i. The sayings of wise men, in one book. 8. Parabolæ et Sales. Parables and Pleasant Sayings, in one book. 9. Collectiones Chronicorum. Collections of Chronicles. 10. Epistolæ ad Wulfsigium Episcopum, lib. 1. Epistles to bishop Wulfsig, in one book. 11. Manuale meditationum. A Manual of Meditations. Besides these original works, he translated many authors from the Latin, &c., into the Saxon Language, viz.: 1. Bede's History of England, a copy of which is in the public library at Cambridge, with the following distich:

Historicus quondam fecit me Beda latinum
Ælfred rex Saxo transtulit ille prius.

2. Paulinus Orosius's History of the Pagans. 3. St. Gregory's Pastoral, &c. The first of these, with his prefaces to the other, together with his laws, were printed at Cambridge in 1664. His laws are likewise inserted in Spelman's councils. 4. Boethius de Consolatione, lib. v. Boethius's Consolations of Philosophy, in five books. Dr. Plot tells us king Alfred translated it at Woodstock, as he found in a MS. in the Cotton Library. 5. Æsopi Fabulæ. Æsop's Fables, which he is said to have translated from the Greek both into Latin and Saxon. 6. Psalterium Davidicum, lib. i. David's Psalter, in one book. This was the last work king Alfred attempted, death surprising him before he had finished it; it was, however, completed by another hand, and published at London in 1640, in quarto, by Sir John Spelman. Several others are mentioned by Malmesbury, and the old history of Ely asserts that he translated the Old and New Testaments. That none of the learned amongst his own subjects were willing or able to record the actions of so great and good a prince, would appear surprising, if we neglected to take into our view the extreme ignorance of the times, concerning which he himself complained, that from the Humber to the Thames there was not one priest who could explain the service of the church, which was then in Latin, nor was there one of the same order to be found between London and the Lea, capable of translating the easiest Latin book. The history of his life was performed at last by a stranger, 'Asserius Menevensis,' collected from among the Welsh, his enemies to so great a degree, that the very name of Saxon was abhorred by them. If the history is not written with the elegance of more modern times, yet it is certainly far above what could be expected from the general rudeness of that age; he conveys to us an image in impressive language of the most illustrious monarch that ever graced the English throne. It was afterwards published by archbishop Parker, in the Old Saxon character, at the end of his edition of Hassingham's History, printed in folio, in 1674.—[*Universal Biog'y.*

CIRCULATION OF BLOOD.

PERHAPS there are few points more remarkable in the history of the progress by which man has arrived at his present knowledge of the universe, than that it is only two hundred years since he discovered that the blood in his own and in other animal bodies is constantly circulating. England claims as one of her sons, the man whose powerful intellect at last established this truth, in opposition to strong appearances, and to the most fixed prejudices. Dr. Harvey published his proofs in the year 1619. A person who tries to imagine what the science of medicine could have been while it took no account of this fact, on which, as a basis, all certain reasoning about the phenomena of life must rest, is prepared for what old medical books exhibit of the writhings of human reason, in attempts to explain and to form theories, while a fatal error was mixed with every supposition. The chief circumstance which prevented the earlier discovery of the circulation was, that on examining dead bodies, the arteries were always found empty of blood; which was the reason, also, of these vessels being called *arteries*, or *air-tubes*.

We now know, that as the Thames water spreads over London in pipes, to supply the inhabitants generally, and to answer the particular purposes of brewers, bakers, tanners, and others, and is then in great part returned to where the current sweeps away the impurities; so, nearly, in the human body, does the blood spread from the centre, through the arteries, to nourish all the parts, and to supply material of secretion to the liver, the kidneys, the stomach, and other viscera; and returns from these by the veins, towards the heart and lungs, to be purified, and to have its waste replenished, that it may again renew its course.

The circulation may be more particularly described thus. From the left chamber or *ventricle* of the strong muscular mass the *heart*, a large tube arises, called the *aorta*; and by a continued division or ramification, opens a way for the bright scarlet blood to even the minutest part of the living frame; the extreme divisions or twigs being so small, that they are called *capillary* or hair-like tubes. At the terminations of these vessels, the blood after answering the purposes of general nutrition, &c., by which it loses its bright colour, enters the commencements of the *venous tree* or returning channel; and gliding successively from smaller to larger branches, returns towards the right chamber or ventricle of the heart, requiring purification and partial renewal. Considering the great arterial and venous systems of the body as *twin trees*—the *scarlet* and the *purple*, with corresponding and meeting branches, and with trunks will touch each other at the heart, it will appear that they again completely meet or inosculate by their extreme roots, and thus form a continued or circular channel. The root of the venous tree by which the blood spreads from the right chamber of the heart to the lungs, is called the *pulmonary artery*, and that of the arterial tree, by which the blood returns to the left chamber, is called the pulmonary vein. Both of these ramify in the spungy masses of the lungs, forming a great part of the pulmonary substance. Fresh material for the blood is brought from the *digestive organs* by the *lacteal absorbents* and *thoracic ducts*, and is constantly pouring into a large vein near the heart, to be completely mixed with the dark or returning blood by a violent agitation or *churning* during its passage through the heart. The mixture on leaving the right ventricle is strained through the minute ramifications of the vessels in the lungs, and at the same time is exposed to the action of the air entering the cells of the lungs in respiration, by which exposure the dark purple blood becomes again pure scarlet, and when it reaches the left chamber or ventricle, is ready to set out on its journey as before, charged with new life and nourishment. The two chambers or ventricles of the heart have each an anti-chamber or *auricle* (so called from an external resemblance to a dog's ear,) into which the blood is first received from the veins; and there are valvular doors between the auricle and ventricle, which allow the blood to pass readily into the ventricle, but oppose its recoil during the ventricular contraction. Similarly acting valves are placed between the ventricles and great arteries. There are valves also in many of the veins, over the body, to secure the natural course of the circulation. Besides the important change or purification which the blood undergoes in passing through the lungs, its composition is much influenced by the action of the kidneys, of the exhalants of the skin, and of the liver; the two former relieving it from superfluous moisture and salts, the last, from a large quantity of matter in the form of bile.

The description given above of the circulation of the blood is only an outline; and by showing the manner in which fresh material enters, it contains more than Harvey knew of the subject. In this department of knowledge, as in most others, we have advanced from the very general and vague, to the more particular and precise:—and just as the general nature of steam was known long before it served in steam-engines; and as the period of the moon's revolution had been accurately observed for thousands of years before the fluctuations in her velocity could be calculated so as to make her the mariner's best guide in his courses across the ocean,—so, when Hervey had proved the simple fact of the circulation of the blood, he had left much yet to be done, by observing and reasoning from minutiæ, to render the knowledge available for the many useful purposes which it is calculated to serve. Within a few years only, has the importance of the subordinate

circumstances been fully appreciated—as is evinced by the numerous works composed to elucidate them; but many of which works have served only to prove, that if the difficulties were to be solved by natural philosophy, medical men in general had not yet studied it sufficiently to be able to use it successfully. In this section it will be attempted to place certain important points of the subject in a clear light; and by referring directly to the general laws of nature, as explained in the body of the work, to settle existing disputes on some of these points, to remove remaining doubts on others, and to suggest some important new applications.

The fact of the circulation of the blood being once admitted, an inquirer who contemplates the apparatus by which it is effected, is led by the general analogies of nature to conceive—1st. That the ventricle of the heart, at each contraction, empties itself into the great artery;—2d. That the consequent jet causes a wave to pass along to the extremities of the arterial tree, accounted simply elastic, so as to produce every where what is called the pulse;—3d. That the force of the heart, acting along the arteries, forces the blood through their open capillary extremities into the commencing veins and along the veins back to the heart again.—Now these guesses, which Harvey believed completely to describe the circulation, are all nearly true: but the following facts, and others ascertained since Harvey's day, not exactly squaring with them, have rendered farther investigation necessary. 1st. The pulse, instead of being a *distinctly progressive* wave, is almost as instantaneous over the whole body as a shock of electricity;—2d. The arteries are all found empty after death; and if an artery be tied in the living body, the part beyond the ligature, although the action of the heart cannot reach it, is soon emptied through the capillaries into the veins;—3d. Although the rapidity of the blood's passage through the capillaries varies very much, it does not vary in exact accordance with the changes in the rapidity or force of the heart's action. In analysing this subject, it is convenient to follow the blood round from the heart to the heart again, through the three stages of, 1st. *The arteries*; 2d. *The capillaries*; 3d. *The veins*. —[*Arnott's Physics.*

CHEMISTRY.

ATTRACTION.

In the operations and changes of nature, five kinds of attraction, in some measure distinct, are recognized by philosophers.—One kind causes bodies to fall to the earth, the rivulet or brook to descend from the mountain to the ocean; rain, hail, and snow to descend from the clouds; the moon to revolve round the earth, the earth round the sun, and various other sublime operations in the heavens. This is called the attraction of gravitation.

Another kind of attraction unites the different particles of a body, as of iron, wood, silk, &c., so as to give them strength.—From the different degrees of this kind of attraction in different bodies, iron is stronger than lead or copper; white oak is stronger than poplar; silk than cotton, &c. This is called the attraction of cohesion.

Another kind draws a mass of iron to a magnet, gives the needle of a compass a north and south direction, &c. This is called magnetic attraction.

Another kind of attraction draws lightning to a rod, and produces innumerable other experiments in electricity, and is called electrical attraction.

The fifth and last kind is carrying on innumerable changes in the internal arrangements, and in the natures and properties of bodies. By bringing a coal of fire to touch a mass of gunpowder, it produces an immediate explosion, and in an instant changes that solid substance into several airs or gases. By bringing a blaze of fire in contact with a mixture of two gases, oxigen and hydrogen, it produces an explosion more sudden and powerful than gunpowder, and instantly changes two airs into water. The last kind of attraction referred to, by bringing nitric acid, (aquafortis,) a powerful corroder, in contact with potash, another very corrosive substance, produces saltpetre, a comparatively harmless salt.

By similar combinations, produced by the attraction of one body to another, copperas, blue vitriol, verdigris, chrome yellow, soap, starch, sugar, bread, wine, cider, beer, and almost every substance in the whole circle of the useful and domestic arts, are formed. This is called chemical attraction.

The instances of this kind of attraction are literally endless, as are the operations produced by it. And whether artists are aware of it or not, they are entirely dependant upon the laws of chemical attraction, for the success of their operations. Of course, the more familiar they are with these laws, and the more strictly they adhere to them, the fewer will be their instances of failure, and the greater their success.

As all the changes in the chemical world are produced by the various and comparative attractions which bodies have for each other, we shall be under the necessity of bringing to view this great and fundamental principle of the science of chemistry in almost every step of our progress. It may still be proper to remark on the present occasion, that the power, and the various degrees of chemical attraction, and the wonderful precision with which it acts in every case, and the infinitely varied, and interesting and important results which it produces, are alike astonishing and attractive. They are deserving of being understood in the most perfect and familiar manner, by every philosopher and every artist, by every man and every woman in the world.

ESSAYS ON KNOWLEDGE.

BY G. W. LIGHT.

The following is the Introduction to a series of Essays which are to be furnished for this paper, and for the Young Mechanic, a useful scientific work published in this city.

The Author of the universe wants every intelligent being to be a free and deep thinker. This is plain from the fact, that his creatures can enjoy their existence in his boundless creation only in proportion to the extent of their knowledge, and that his benevolence would be very limited, did he not give them this freedom of thought, they being unable to obtain extensive information in any other way. If this be not true, why were we endowed with the noble capacity for reading and reflecting upon the glorious Volume of Nature; and why was it placed before us in all its magnificence, so well calculated to awaken a desire for an acquaintance with its sublime revelations?

Every mind, just so far as it does not possess a taste for the pursuit of knowledge, is in an unnatural state. This I infer from the preceding remarks; and I think that both the observations and the inference, upon examination, will prove to be sound. I would therefore advise every one who does not possess a taste for study, to reflect upon his situation as a member of the universe of Jehovah; to reflect upon the time he has wasted during his life in useless employments, which were calculated to blunt his natural sensibilities; and to resolve for the future to let his conduct be more worthy of the exalted place which he holds in this splendid creation.

I look upon the people of this world as a class of scholars in one of the great schoolrooms of Deity. The only reason why all are not good pupils, is the wrong practices of the world—as is hinted in the advice just given; and these practices have debased the mind so as to lead it to all the low, grovelling pursuits which are common in the world. But the prospect that the great body of the people will, at some future period, be roused to the exercise of its high intellectual powers, is daily brightening. The means in operation for waking up and perpetuating a taste for intellectual improvement, were never so great as at the present day. 'The fountains of the great deep have been broken up; and a deluge of information; theological, scientific, and civil—is carrying all before it, filling up the vallies, and scaling the mountain tops. A spirit of inquiry has gone forth, and sits brooding upon the mind of man. As to the effect, much will depend upon right regulation and direction.'

No sound objection can be brought against the universal spread of knowledge. We were made to be reasonable beings; and 'how can we reason but from what we know?' The world has reasoned superficially, comparatively speaking, long enough. Give the great mass of the people facts—the more the better; and let them reason from them; and then we may look for an extensively enlightened public sentiment on all important subjects. Until this be done, the ten thousand divisions of the world must continue to exist: for doctors must disagree while the mass of the people remain in ignorance—because the intellect of the whole world is needed to decide many of the important questions which are, and ever have been agitated in the world.

It is the duty of every one, then, who perceives the great advantages of universal education, to do all in his power to dissipate the clouds of ignorance which still hang over our globe, in order to hasten the period when the sun of knowledge shall gleam upon the world in all its meridian splendor.

LYCEUMS.

BOSTON LYCEUM.

On Thursday evening of last week, a lecture was given before the Boston Lyceum by George W. Light, the Secretary of the Society, on the subject of 'Business and Study.' The object of the lecture was to prove that study and extensive acquirements were entirely compatible with the most active business of life, and that business men in many respects had a decided advantage for the acquisition of knowledge over those wholly devoted to literary pursuits. By various examples and practical illustrations, the lecturer made out his case to the conviction and satisfaction of his audience.

To give variety and interest to the performance, which was a real Lyceum lecture, a practical business-like production, Mr. L. occasionally introduced passages containing considerable strong poetry, from which we are permitted to make a selection. In speaking of those who profess to have no natural taste for intellectual pursuits, he remarks:—

Have no taste for study? Cannot study?—Who are they? Where are they? Are they in some dark corner of the universe—shut out from all the beautiful things of God's creation—dragging out a brutish existence, with no hope of ever being ameliorated from their gloomy condition? Or are they in a glorious creation, without an understanding to perceive, and a heart to feel, the divine influences everywhere diffused around them? One or the other of these must be the case—if we may make deductions from their own language. If they have the noble faculties of mind, and their own words are correct, they cannot be where a brilliant sun is gleaming down upon them—and where the stars of heaven are glimmering in their diamond radiance? They cannot be standing upon one of the beautiful globes in the eternal space of Jehovah. They can see no giant mountains towering to the clouds—no green vallies spangled with the flowers of the earth smiling around them. They can hear no sound rolling away from the sublime depths of the ocean. They can see no lightnings flashing in the broad expanse above them; nor hear the sound of the artillery of heaven thundering over the wide firmament, as if it would shake the pillars of the universe. If they could see and hear all this,—they would inquire about the earth they tread upon; the beautiful things scattered in such profusion around them; and the sun, and the everlasting stars above them. But it is a fact, that they do possess this inexhaustible mind; and they do dwell in the grand universe of God; and they are obliged to alter their very nature, in order to descend into their deplorable situation. The fact is, the hours of their lives which might be devoted to the pursuit of knowledge, are wasted in practices, the effect of which is to render the mind insensible to the sublimity of the universe in which they dwell.

SOCIAL LYCEUMS.

Though the Lyceum, in all its departments, is eminently a social institution, the beauty and excellence of that feature of its character is never so happily exhibited as in small circles of ladies and gentlemen. In such circles, there can be the same freedom of communication and of conversation, on the part of both ladies and gentlemen, as in a fashionable party. The principal difference between the two is, that one offers a feast of sweetmeats and cordials, the other a feast of minds and souls.

The rich entertainment we received at a Social Lyceum in Boston, a few evenings since, consisted in part of the following communication, which came from the pen and the lips of a lady who seldom fails to contribute her share to a mental repast. We esteem it a favor to extend the same entertainment to our readers, both as a repast and an example worthy their imitation.

Whatever may be the fate of Town, County, State, and National Lyceums, we hope that Social Lyceums will increase in number, spirit, and intelligence, until every lady and gentleman in our land shall have an opportunity to attend and enjoy an intellectual banquet at their own firesides and those of their neighbors.

THE THREE-FOLD NATURE OF MAN.

To every human being the Creator has committed a most important trust—the care of a physical, an intellectual, and a moral nature. It is a care which cannot be transferred or avoided; on each individual must rest the sole responsibility of providing for his own physical, mental, and moral necessities. The most that others can do for us is, to supply the materials—we must use them. The parent offers food to his child, but he cannot force him to eat. The teacher spreads before him the treasures of knowledge, but he cannot force him to receive them. The preacher presents the motives to holiness, but he cannot make him holy.

The great business of life, as regards ourselves, is to take care of this threefold nature, and bring each part to the highest perfection of which it is susceptible. Of course our first work is to make ourselves acquainted with the laws that govern it, and with all the means of preservation and improvement that are within our reach.

Our next work is to form habits of strict obedience to all these *laws*, and carefully avail ourselves of all these *means*.

Let us glance at some of these laws. It is a law of our *physical* nature, that a certain amount of nourishment must be daily received into the system, and the quantity must be neither more nor less than the state of the system requires. Another law is, that a certain number of hours in every twenty-four must be allotted to repose—a repose not merely of the body, and all the avenues to the mind, but of the mind itself; for such is the mysterious action of mind on matter, that the bodily powers will not be refreshed unless the mind reposes also. To the application of this law is affixed the same direction as to the other; the repose must be neither longer nor shorter than the state of the system requires.

Besides the laws which govern all material beings, there is a code of *By-laws* for each individual, growing out of his peculiar constitution and circumstances—which it is equally his duty and interest to obey. To each of these laws severe penalties are attached, as every transgressor knows full well.

Our *intellectual* nature, too, has its laws, and woe to the one who breaks them. It is a law of mind, to grow stronger by action—and the punishment of idleness is imbecility. Another law of mind is, to expand in proportion to the number of ideas presented to it. You cannot fill the mind as you do a vessel—pour in ever so many thoughts, and it will only be enlarged by them, and prepared for more. Thus it will probably go on forever, increasing in knowledge, and in the capability of acquiring knowledge.

The *heart*, too, that unruly thing, has its laws, but they are too often neglected. One of the most important is, that the heart is hardened by sin, and the moral sensibilities are worn out by being trifled with.

An acquaintance with the laws of our three natures, will suggest the means of preservation and improvement.

When we look round upon the community, and see how much time and thought and money is expended in provision for our animal nature—how much concern is manifested about 'what we shall eat, and what we shall drink, and wherewithal we shall be clothed,' we shall be apt to suppose that this part of our duty is sufficiently understood and appreciated. But it is not so. In general, this interest is worse than useless, because it has a mistaken aim; the means of *self-gratification* are sought instead of those of *self-preservation*. The consequence of this mistake is, that the world is full of disease and premature death. Few persons take the pains to make themselves acquainted with the laws of their corporeal being, still less with those adapted to their peculiar constitution and situation, until they are reminded of its importance, by symptoms of disease and decay. This explains the origin of the universal prejudice against 'living by rule,' and adopting precautions and preventives; 'because,' it is said, 'these careful people are always invalids'—not understanding that their want of health is the *cause*, and not the *consequence* of this care.

The moral nature is manifestly so much more important than the others, that one would expect to see it occupying the first place in the attention of every rational being. Though much is said, and written, and preached about it, yet after all, there is very little done in the way of regular, systematic effort to raise the moral character.—Every one admires moral excellence, and desires to possess it—but comparatively few persevere in the faithful use of all the means of becoming better. All are lamenting their deficiencies, but how few put forth vigor and energy enough in the work of improvement to satisfy themselves—or to make visible progress from day to day. Do they not oftener 'sigh and go backward?'

There are some however who are really in earnest in the work of moral renovation. With such, to be pure, to be holy, is the all-absorbing concern, and they do rise daily in the scale of excellence. No zeal can be more laudable, for nothing is so important; yet to such I would say, remember you have an immortal mind committed to your care, which it is equally your duty to cultivate. The improvement of the mind may be made a very important aid to the improvement of the heart. Let no one say, 'I find so much to be done within and around me in the way of moral and religious advancement, that I have no time for intellectual pursuits. The individual who thinks so, must be mistaken. It is unquestionably a christian duty to cultivate the mind. Why were minds given us? To use them in fulfilling the great purposes of existence. The more they are strengthened and enlarged, the better are they fitted for the accomplishment of these purposes. A person will increase in the capacity for happiness and usefulness in proportion to his increase in *intellectual power*, provided he at the same time gives due attention to his *moral* and *corporeal natures*. S. J.

BARNUM'S SERIES.

Four School Books have recently been prepared by H. L. Barnum, which must be an acquisition to the means of education. They are in a connected series, and founded upon the original powers and natural progress of mind. The first number in the series addresses itself to those faculties of children which first manifest themselves, and is well designed to call those faculties into exercise. The principal faculty here recognized, is the power of observation and imitation, aided by the most ready instrument for that purpose, viz.; the EYE, more than the ear.

The second number goes one step farther in exercising these early faculties of children, and

calls to their aid another instrument, viz.; the HAND. It leads them to form letters, and other figures.

The third and fourth numbers call into exercise the power of comparison and reflection; which is done by combining words and sentences, the elementary principles of Geography, &c.

As these books are founded upon the elementary and progressive powers of the human mind, they are calculated, by exercising these powers, to afford satisfaction to the subjects both of the powers and the exercise; or, to give instruction and entertainment at the same time.

As they are fitted alike for schools and families, we take a pleasure in presenting them to the notice of our readers, especially of parents and teachers.

Comparative Meteorology.

The prospect is every day becoming more encouraging, of being able within a moderate period of time to present to our readers a comparative view of the weather, embracing the temperature, winds, quantity of rain, &c., in many places on our continent, from Quebec to New Orleans, and probably to Mexico and South America. We have already Tables for December, kept in several places, which we intend inserting in our next number.

It is evidently practicable, to give a comparative view of the state of the atmosphere, on the same day, and even the same hour, in Quebec, Boston, Philadelphia, Charleston, New Orleans, Buenos Ayres, Cape Horn, London, Paris, Liberia, Cape of Good Hope, New Holland, Calcutta, Canton, St. Petersburgh, and many other places upon opposite sides of the earth. Such a view, to say the least, would be a curiosity, and it could hardly fail of leading to a more enlightened and more correct theory of winds and of the weather, than we have at present.

If all schools on this and the other continent should follow the example of the Savannah (Ga.) Female Seminary, the work would be done; at least it would have been fairly begun.

As we should be glad to give a comparative view of the weather in as many places as possible for January, 1833, we shall esteem it a particular favor for any school or individual who may keep a Table for this month, to forward it for the use of the Family Lyceum, and through that for the use of many individuals in all the states in the Union.

Railroad Journal.

We have already more than once noticed a New York weekly, under the above title. We are led again to notice it, from the great interest we take in its objects, and our warm approbation in the mode of conducting it. The number just received is one of great interest and importance. We make from it liberal extracts for our present number, and if it were practicable, should be glad to present to our readers a map of Antwerp, with the adjoining places, the present seat of war in Europe, given in the last number of this Journal.

Electrical Telegraph.

'The following communication was handed to us by an intelligent foreigner, now in this city, relative to the transmission of intelligence between commercial cities, as New York and Albany, or New York and Philadelphia—for instance, by means of Electricity. He has also explained to us his proposed plan of communicating or receiving intelligence between any two given points, however distant, almost instantaneously. The *principle* is by no means new; but the *application* of it to this important purpose has not been, that we are aware of, attempted by any person before. The inventor, Mr. Borch, of St. Croix,—who has, as he informs us, secured a patent for his invention,—thinks it may be applied with great ease to long lines of Railroad.

To the Editor of the American Rail-Road Journal.

Sir,—On the principle that the electric fluid can, by the means of an insulated conductor, be conveyed to any distance instantaneously, and that where there is any small opening in the conductor a spark will appear, which principle has been proved or established by numberless experiments. I have discovered a mode by which an instantaneous and reciprocal communicator of any intelligence from one place to another, at any distance, may be made. G. V. Borch.

P. S. This communicator might especially be of great use in railroads. [*Railroad Journal.*

Foot Railroads.

Those inventions are the most important which enable all classes of society to make the best use of their personal strength. Railroads for the use of individuals, like a foot path, will do this. Stages, steam-boats and railroads for steam and horse carriage, will never do half the conveyance of passengers and goods over the country. Large railroads must necessarily be confined to great channels of communication: they require too great capital to be extended to every village.—It is stated that to move a weight of a ton on a level railroad requires but the strength that is requisite to raise up eight pounds over a pulley. To move 500 lbs. on a level railroad, would require then only the strength necessary to raise up 2 pounds over a pulley. Carriages of about the weight of a wheel-barrow, or less than fifty pounds, might be made for what I shall call a foot railroad. Probably the families that go to country stores, do not carry generally more than 100 lbs. weight; and most commonly they do not carry more than 50 lbs. But suppose that it is 100; then there is a carriage of 50 and a load of 100 lbs. The force required to move this on a level railroad, will be only a small fraction more than that required to raise half a pound over a pulley. And then there is level path to walk on. If there are departures from a level, some more strength must be exerted at the ascending planes; but then the traveller can rest on his carriage at the descents. In fact, according to the principles of mechanics, as easily as a man of 140 pounds weight can travel up a hill 50 feet high, he can move forward a load of 280 pounds a mile and a quarter on a level railroad. It will appear then, that foot railroads will be a vast public benefit: an advantage not to the rich only, but chiefly to the laboring classes. [*Railroad Journal.*

Philadelphia and Trenton Railroad.

We learn that the whole of the grading and all the bridges, on the line of this road, are placed under contract, that the work is to be commenced immediately, and that it will be perserveringly and vigorously prosecuted.

We believe the doubts of many citizens, as to the expediency of a Railroad running so nearly parallel with the Deleware river to Trenton, are pretty generally removed. In the season of the year, when travelling and transportation between the two cities is greatest—the communication by steam is usually totally prevented, in consequence of ice. The great length of last winter, which for several months closed the navigation of the river, and the enormous extent of carriage, convinced the most skeptical of the necessity of such an improvement as the one which is about to be commenced. When completed, it will be the most direct, sure and expeditious route between the two cities; its location entirely obviating all the objections which will operate against the other routes, crossing the river where there are no bridges. The difficulty, will be an insuperable objection to the Bordentown and Amboy Railroad, and the Trenton route will receive the preference from travellers, as well as for the transportation of merchandize.

The Railroad will be of considerable importance to the citizens of Bucks County, passing as it does through the most wealthy and densely populated extremity; adding greater facilities to the already superior advantages which the citizens residing on the borders of the Delaware have, in their intercourse with Philadelphia. *Railroad Journal.*

The Railroad.

It gives us great pleasure to inform our readers that the Railroad is now finished and in complete order, from the Depot at North Spring to Belfield, a distance of forty miles. A party of our citizens, accompanied by several Members of the Legislature made the first trip between the two places on Tuesday last; and we understand that there was an universal expression of admiration, elicited as well by the beauty and substantial construction of the work, as by the conviction of the superior facility and safety which this mode of transportation possess over all others. The return trip from Belfield to North Spring, was performed in about *two* hours, deducting the time lost in the several stoppages. To those who have not yet had an opportunity of personally observing the facilities of this method of travelling, it may not be amiss to say, that the party above mentioned breakfasted in Petersburg, dined and spent part of the day at Belfield, and returned to town before dark, thus traversing a distance of 85 miles without the least fatigue.

It is expected that the section of the road between the town depot and that at North Spring, will be completed by the 1st of February next. [*Petersburg Intelligencer.*

The Lace Bark Tree,

(Lagetta lintearia,) grows in the high rocky hills of Jamacia, to the height of 20 feet; the bark is thick, and may be separated into 20 or 30 laminæ, white and fine like gauze; of this, caps, ruffles, and even whole ladies' suits of clothes, have been made. [*Railroad Journal.*

Coal Trade.

We have laid before the public some statistical information respecting certain branches of the Coal trade, including a view of the capital invested and labor employed in the business of mining and transporting to market the amount of the annual exportations of this mineral from this region. We have not entered into any calculation relative to the cost or value of the very expensive improvements incident to mining establishments. Neither have we said anything concerning the lands themselves, whence our supplies are derived. The whole number of miners, laborers, horses, cars and boats employed, together with the respective wages of the two first, and original cost of the latter, is comprehended in our statement, without any reference to other collateral subjects which might be introduced. The amount of coal exported from this region during the season which is just ended, is equal to two hundred and four thousand tons. If sufficient encouragement by early purchases is afforded to the industry of the miner and laborer, this quantity may be indefinitely increased, in a ratio at least equal to any future demands. No one in any degree acquainted with the extensive resources of this region will for a moment question the truth of this proposition. The natural capacity of our mountains to supply the article is literally boundless—the means of exportation adequate—the industry of our population greater than any requisitions that can be made upon it. An example afforded by a single locality will illustrate our meaning. On the West Branch railroad there are 325 cars, belonging to thirty colliers. Contracts have been already made for supplying 100 additional cars. Without including other cars than those which are already on hand or positively engaged, we will commence our calculation by stating that each car will carry two and a half tons of coal. Allowing only one trip per day, while many very frequently make two, the sum total would equal 1000 tons per day, or 6000 tons per week. Estimating a period of 20 weeks for active operations during the season, the aggregate quantity would amount to 180,000 tons, almost thrice as much as is required for the annual supply of New York. This is a very moderate statement of what can actually be accomplished by one-third of the coal region. Should the backwardness of purchasers and contractors suffer a considerable portion of the season for active operations to elapse without making provision, our calculation may be verified—but the fault will not be ours.

Of the above mentioned 204,000 tons of the coal shipped from this region, there passed down the West Branch railroad

Mount Carbon,	67,059
Schuylkill Valley,	57,234
Mill Creek, about	27,981 *
	30,300
Total,	182,574

The balance of the 204,000 tons was mined on the line of the canal in this vicinity.

One miner can mine 1 1-2 tons of coal per day—say that he works 5 days in the week, and 45 weeks in the year, this will make 225 days; to mine 203,000 tons of coal will require in round numbers 600 miners, It will require as many persons to haul out, skreen, and convey the coal to the landings, making openings, &c. as it does to mine the Coal—therefore say 600 laborers.

The West Branch railroad is about 12 miles long—the average distance of hauling thereon about 9 miles.

Mount Carbon railroad 4 miles,	do. do.	3 do
Mill Creek railroad 4 miles,	do. do.	3 do.
Schuylkill Valley do. 10 miles	do. do.	5 do.
		20

Average distance (say 5 miles)—one horse hauls 4 wagons, and makes two trips per day—each wagon averaging 1 3-4 tons—will make 14 tons for each horse per day—multiplied by 225 days, gives 3150 tons to each horse—which divided into 203,000 gives 65 horses. It requires an equal number of horses to haul the coal out of the drifts—say 130 horses.

To carry this Coal to market it requires about 400 boats—400 horses—and two men and one boy to each boat—making 1200 men and boys on the line of the canal. Total, 240 persons and 530 horses actually engaged in mining the above coal and conveying it to market.

There are on the West Branch Railroad in use 325 cars, Mount Carbon 150, Mill Creek about 200, Schuylkill Valley 230—total 905 cars.

The cars on the West Branch and Mount Carbon railroads cost on an average $300 a piece—and those on the Mill Creek and Schuylkill Valley cost about $200 a piece—which would amount to

	$64,500
400 boats at $500 each,	200,000
530 horses at 40 each,	21,200
600 miners at 7 each per week,	189,000
600 laborers at 6 each per week,	162,000
1200 boatmen at 5 do. for do. 32 do.	192,000
Active capital,	$828,750

RECAPITULATION.

Miners,	600
Laborers and boatmen,	1800
Total,	2400
Horses	530
Cars	905
Boats	400
Active capital,	$828,750

Price of Fuel in New York, Decem. 18, 1832.

COAL.

		Cargo.	Retail.
Liverpool, per chaldron,		$11,50	$13,50
Sydney,	do.	9,50	10,50
Virginia,	do.	9,00	10,00
Schuylkill, per ton,		9,50	11,00
Lehigh,	do.	9,50	11,00
Lackawanna,	do.	9,50	10,00

WOOD.

Hickory, per load, (1-2 cord)		$2,50 a	3,00
Oak,	do.	2,00 a	2,25
Ash,	do.	2,00 a	2,25
Pine,	do.	1,50 a	2,00
Chesnut	do.	1,37 a	1,50

The following is the quantity of Coal sent to market in the years 1831 and 1832, as near as can be ascertained in round numbers:

	1831.	1832.
Schuylkill,	81,000 tons.	204,000
Little Schuylkill,		14,000
Lehigh,	43,000	76,000
Lackawanna,	53,000	85,000
	177,000	379,000
The consumption last year, as near as can be ascertained, was		227,000
		152,000

Showing an increase over the consumption of last year of 152,000 tons, and over the supply of the same year of 202,000 tons.—*Miners' Jour.*

COMPARATIVE

METEOROLOGICAL TABLE.

Date.	CHARLESTON, S. C. Therm. 7 A. M.	Weather.	MONTREAL, L. C. Therm. 7 A. M.	Weather.
Oct. 1.	61	Cloudy.	51	Rainy.
2.	52	Clear.	48	Rainy.
3.	56	Clear.	46	Fair.
4.	60	Clear.	50	Fair.
5.	65	Cloudy.	51	Fair.
6.	67	Cloudy.	52	Fair.
7.	68	Clear.	52	Fair.
8.	68	Clear.	45	Fair.
9.	73	Cloudy.	44	Fair.
10.	73	Cloudy.	57	Rainy.
11.	74	Clear.	56	Fair.
12.	74	Cloudy.	47	Fair.
13.	74	Rainy.	42	Fair.
14.	74	Rainy.	43	Fair.
15.	64	Clear.	32	Fair.
16.	62	Clear.	38	Fair.
17.	65	Clear.	47	Fair.
18.	68	Drizzly.	60	Fair.
19.	68	Clear.	38	Fair.
20.	71	Rainy.	56	Fair.
21.	72	Cloudy.	43	Fair.
22.	74	Rainy.	35	Fair.
23.	70	Rainy.	45	Rainy.
24.	62	Fair.	35	Rainy.
25.	54	Fair.	35	Fair.
26.	53	Fair.	23	Fair.
27.	53	Fair.	39	Rainy.
28.	52	Fair	32	Fair.
29.	45	Cloudy.	27	Fair.
30.	48	Cloudy.	31	Fair.
31.	60	Cloudy.	37	Fair.
N'v. 1.	65	Drizzly.	52	Fair.
2.	67	Cloudy.	46	Fair.
3.	71	Fair.	36	Fair.
4.	67	Fair.	40	Rainy.
5.	68	Cloudy.	41	Fair.
6.	70	Cloudy.	30	Fair.
7	70	Cloudy.	35	Fair.
8.	64	Cloudy.	21	Fair.
9.	51	Fair.	30	Fair.
10.	43	Fair.	35	Fair.
11.	51	Fair.	32	Fair.
12.	53	Fair.	31	Fair.
13.	54	Fair	35	Fair.
14.	55	Cloudy.	22	Fair.
15.	57	Cloudy.	12	Fair.
16.	50	Rainy.	28	Fair.
17.	59	Cloudy.	32	Fair.
18	56	Cloudy.	35	Rainy.
19.	62	Cloudy.	34	Rainy.
20.	42	Fair.	35	Fair.
21.	45	Fair.	13	Fair.
22.	46	Cloudy.	22	Fair.
23.	45	Fair.	29	Fair.
24.	36	Fair.	29	Fair.
25.	40	Fair.	22	Fair.
26.	47	Fair.	32	Snow.
27.	54	Fair.	34	Rainy.
28.	57	Fair.	29	Rainy.
29.	52	Fair.	19	Fair.
30.	58	Fair.	18	Fair.

* There also passed down this road 33,470 shingles and 628,092 feet feet of boards.

BOOK OF NATURE.

THE USES OF VOLATILES.

The uses of the poultry kind, especially of such as are domesticated, are too obvious to be enumerated; it may, however, be remarked, that the common Hen, if well supplied with food and water, is said to lay sometimes two hundred eggs in a year; and the fecundity of the Pigeon in its domestic state is so great, that from a single pair nearly fifteen thousand may be produced in four years.

The flesh of the Grouse kind is esteemed for its delicacy; the Peacock in some countries is considered as a luxury; and although it is in a great measure for his singular plumage that man has been tempted to follow the Ostrich in his desert retreat, some of the African tribes are very fond of his flesh: and even the Romans appear to have considered it a dainty; for it is recorded of Heliogabalus, that he had the brains of six hundred of these animals, at a feast, served up in one dish! He should immediately after partaking of that dish, have buried his head in the sand, and been ashamed to resume the erect form of man, whose character he had disgraced.—There are besides many parts of this animal which are supposed to be very salutary for medicinal purposes, and their strength and swiftness seem to render them very fit for the purposes of travelling or carrying burdens; for Moore relates, that at Joar in Africa, he met a man travelling upon an Ostrich; and Mr. Adamson informs us, that when he was at the factory of Podore there were two young Ostriches, the strongest of which was much fleeter than the best English race-horse he ever saw, although he at that time carried two negroes on his back.

If in the feathery tribe some appear to be formed to please us with the beauty of their plumage, as the Goldfinch, the Bullfinch, and the Humming-bird; others, as the Thrush, the Blackbird, and the Canary, delight us with the melody of their song. The Lark soars aloft and salutes the new-born day with his cheerful notes. The Nightingale soothes the weary laborer as he returns from his daily toil, by his fascinating strains. The little Robin, in return for the protection our fences have afforded him, exerts himself to render the hedges vocal, in soft and tender melody; and the Sparrow endeavors to amuse us with her chirpings.

The Swallow, also, as if sensible of the undisturbed possession she has been allowed to take of our premises, during the time of her necessities, catches upon the wing a multitude of flies, gnats and beetles, and frees us from a number of troublesome vermin before she bids us farewell! Birds of the Rook and Pie kind, although a noisy and chattering tribe, may be of infinitely more use than we have the sense to discover, by the destruction of grubs, worms, and eggs of vermin; and the common carrion-crow may be no less necessary in our climate, than the Egyptian vulture and the Ossifrage of Syria. The Vulture, indeed, is common in many parts of Europe, and abounds in America, Asia, and Africa. In Egypt and other warm countries, he is of singular use. Numerous flocks of them are always hovering in the neighborhood of Grand Cairo; and for the services the inhabitants experience, by these animals devouring the carrion and filth of that great city, which in such a sultry climate would otherwise soon putrify and corrupt the air, they are not permitted to be destroyed. The Ossifrage of the woods of Syria and Egypt feeds on the dead carcasses of fowls and reptiles. This brings us to say a few words on the use of *rapacious fowls*, which may be also applied to *wild beasts* in general.

Better perhaps it may appear to the imperfect reasoning of short-sighted mortals, that the business of mutual destruction had been avoided in the economy of nature, and instead of that circuit of prey and devastation, which we observe, all animals had been formed to live on vegetable food, and suffered to die a natural death. But independent of the difficulty that occurs as to how such a number of creatures could be fed from the same source, we do not consider the state of suffering to which many of them must necessarily have been exposed, if they had been left to perish by protracted famine, after the decay of their bodily powers rendered them unfit to go in quest of food. Compared with this, is it not a far more happy dispensation that animals are formed for the destruction of each other? and that (to follow the course of one circle by way of specimen,) while the tree-louse lives on plants, the *musca aphidivora* lives upon the tree-louse; the hornet lives upon the musca aphidivora; the dragon-fly on the hornet; the spider on the dragon-fly; the small birds on the spider; and the hawk on the small birds.

Deprived of reason the innocent lamb licks the hand raised for its destruction; and the suffering which animals feel upon the speedy extinction of the vital spark, must be momentary indeed, in comparison of the pangs they must have undergone, if they had been left to expire by old age. Indeed, according to this plan, old age would be impossible; for what would the world soon become were its numerous tenants so cut off, and the putrid carcasses to lie unburied?—the circumambient air, now the source of life and vitality, must then in a short time be rendered pestilential, and bearing upon its wings the noxious vapors, deal death and desolation with increasing malignity to every climate, until the beautiful theatre of life and activity became one great charnel-house, and the animating flame be forever extinguished in the awful silence of eternal night.

Instead, therefore, of finding fault with the merciful dispensations of our all-wise Creator, and repining that lions and tigers, bears and wolves, eagles and vultures, serpents and crocodiles, and voracious monsters of the deep of every description exist, let us rather rejoice that wherever the carcass is exposed on the field, there will the vultures be gathered together; and that, where the lion and serpent may die in their sequestered retreats, innumerable vermin, attracted by the scent, will soon find them out and leave not a vestige of putrefaction behind.

Before we conclude with the tribe of volatiles, we will just remark, that *these* are not the only uses for which this order of beings seem to have been created! From the feathery creation we may also learn lessons of wisdom on the most interesting and important subjects! What an example of conjugal constancy and fidelity do we discover in the turtle dove? What a pattern of filial affection in the young stork? What a lesson for presumptuous pride have we in the answer of Solon to the monarch of Lydia. When seated on his magnificent throne, and surrounded by all the appendages of external pomp and pageantry, Crœsus asked the Greek philosopher, if he had ever seen so magnificent a spectacle? 'After having seen the plumage of the Pheasant, he could not be astonished at the sight of any other finery,' was the cool reply!—And what comfort may we derive, under the vexatious losses and crosses of life, from the argument drawn by our Divine Teacher against sinking under despondency or anxiety: 'Behold the fowls of the air; for they sow not, neither do they reap, nor gather into barns: yet our heavenly Father feedeth them. Are ye not better than they?'

'Behold, and look away your low despair!
See the light tenants of the barren air:
To them nor stores, nor granaries belong;
Nought but the woodland and the pleasing song;
Yet, your kind heavenly Father bends his eye
On the least wing that flits along the sky.'

INSECTS.

'Where greatness is to nature's works deny'd,
In art and beauty it is well supplied:
In a small space the more perfection's shown,
And what is exquisite in little's done.'

Insects have been reckoned by some among the more imperfectly formed of nature's works; but in this most numerous class of animated beings, where shall we find a single instance in which this is made to appear? In all that prodigious variety that exist betwixt the Scorpion and the Mite, we certainly behold in the structure of insects abundant evidence of the most exquisite skill; and if by means of the microscope we extend our researches downwards through that minute order of beings, till we arrive at those invisible animalculæ which are computed to be *twenty-seven millions* of times smaller than the mite, the same evidence of wisdom and design present themselves in every gradation, and all ideas of imperfection cease.

Of all productions in nature insects are by far the most numerous, and though at first sight herbs of the field seem to be the parts of organised matter produced in the greatest abundance, yet upon minute inspection we find every plant supporting a multitude of scarce perceptible creatures, that fill up the compass of youth, vigor and age, in the space of a few days' existence. In Lapland, and some parts of America, insects are said to be so numerous that if a candle is lighted they swarm about it in such multitudes that it is instantly extinguished.—As insects are endowed with the various powers of creeping, flying, and swimming, there is scarce any place, however, remote and secure, in which they are not to be found.

It is the infinite number of these invisible animals that makes stagnating waters appear of so many different hues, as green, brown, reddish, &c.

It is not at all surprising then, that such an accurate researcher into nature's works as the excellent Mr. Boyle, should observe 'that his wonders dwelt not so much on nature's clocks as her watches.'—In several kinds of these creatures, invisible before to mortal eyes, it is not only easy to discover, by means of a good magnifier, the external appearance of their mouths, their horns, their trunks, and other members, but the very motion of their heart and lungs! Now as it has been remarked, as these little animals are discovered to be organized bodies, how fine and subtle must be the several parts that compose them? How difficult to conceive the extreme minuteness of the muscles necessary to the heart, the glands for the secretion of the fluids, the stomach and bowels for the digestion of the food, the fineness of the tubes, nerves, arteries, veins, and above all, of the blood, the lymph, and animal spirits, which must be infinitely more so than any of these! Here the utmost stretch of imagination is brought to the test, without being able to form any adequate conception; but these inconceivable wonders, instead of conveying any idea of imperfection, as to the skill of the artist, must from what they make to appear, inspire the attentive observer with very different emotions, and force him to exclaim,

'Thysell, how wond'rous then.'

The beauties and symmetry of some of those minute objects so viewed, are suprising indeed. What a metamorphosis do they seem to undergo under the magic-working glass? Creatures that before seemed small and despicable, now 'appear the pride of Nature, wherein she has bestowed more nice and delicate art, and displayed more profusely the rich embroidery and elegant beauties and garniture of colors, than in any of the larger species of animals.' Even the dust that adheres to the butterfly's wing, and to which it owes the beautiful tints and variegated hues which adorn it, is said to be an innumerable collection of extremely small feathers, as perfect in the structure and symmetry of the arrangement, as they are beautiful in the coloring.

But this is not all; the very circumstances adduced as marks of imperfection in the insect tribe: viz. their being enabled to live for some time after being deprived of those organs necessary to live in the higher ranks, and their amazing numbers, ought rather to be considered as arguments to the contrary.

The former is no doubt essentially necessary to the preservation of a species exposed to so many casualities, as those in particular who live on blood, and cannot, therefore, partake of a meal, without giving their enemies notice of their presence; and the latter, to prevent the extinction of a short-lived race, which come into existence at a time when there are so many open mouths ready to devour them.

Without these two characteristic distinctions of the insect tribes, although they may be deemed imperfections by the more imperfect powers of short-sighted mortals, it is probable that long ere now some of those exquisite pieces of nature's workmanship must have disappeared from the creation, and for want of those connecting links the whole beautiful fabric of the universe must have fallen to decay; for trifling as some of those minute or imperceptible objects may appear, the language of philosophy is

—'Each crawling insect holds a rank
Important in the plan of HIM who framed
This scale of beings; holds a rank, which lost
Would break the chain, and leave a gap
That nature's self would rue.'

Instead, therefore, of having the presumption to stigmatize in the most remote degree, this particular order of creatures of the Almighty, as affording evidences of imperfection, let us rather, from similar considerations, adopt the words of the more judicious Swammerdam; 'After an attentive examination,' says, he, 'of the nature and anatomy of the smallest as well as the largest animals, I cannot help allowing the *least* an equal, or perhaps a superior degree of dignity. If, while we dissect with care the larger animals, we are filled with wonder at the elegant disposition of their parts, to what a height is our astonishment raised, when we discover all these parts arranged in the least in the same regular manner?'—And sum up the dispute in the words of another naturalist: 'Of this dispute it is only necessary to observe, that the wisdom of the Creator is so conspicuous in all his works, and such surprising art is discovered in the mechanism of the body of every creature, that it is very difficult, if not impossible, to say where it is most, and where it is least to be observed.'

It is impossible in the compass of this book to do any thing like justice to a subject which can never be sufficiently investigated. We will, however, consistent with our general plan, notice a few facts and striking peculiarities in this mysterious and numerous order of beings, by which it is most distinguished from the others, and in which it will be sufficiently evident that insects are also the children of the same common parent, whose wisdom and goodness are so conspicuous in his other works.

In the head of an insect no organization of the brain is said to be discovered, but the want of this is abundantly made up by that medullary thread which communicates the vital principle to the other parts of their bodies, and endows them with that tenacity of life, which, as has been already observed, is so useful to the species. Neither are they apparently furnished with the usual organs of smelling and hearing, but whether the olfactory nerves communicate with the feelers, and the auricular organs are situate in the antennæ, as Mr. Barbutt supposes, or not, there can be no doubt, from the readiness of Wasps, Flies, &c. to betake themselves to their wings and fly to dainties at a distance, and the alertness of Bees in sallying out to the relief of a brother in distress when he alarms them by his noise outside the hive, that insects are not deficient in the senses of hearing, wherever the organs may be situated. The manner of respiration is different in insects from other animals; they breathe through pores placed in the sides of their bodies, and this also fits them for that remarkable peculiarity of living in separate parts. In the composition of insects no bones are made use of, but this defect is supplied in some by a membraneous or muscular skin, and in others by a crustaceous or horny covering. Their eyes are fixed, and they have no eyebrows; but to prevent them from injury, the latter want is supplied by the external tunic of their eyes being hard and transparent: and to remedy the former, some insects have four, some six, others eight, while the number of lenses in some of those who have only two is amazing indeed. Flies, wasps, &c. have the outward coat of their eye made of curious lattice-work. Pagett is said to have discovered no fewer than 17,325 lenses in the cornea of a butterfly!!

QUESTIONS ON LYCEUM No. 22.

For what was Roger Bacon celebrated, and when born?

By whom was he thrown into prison?

How long was he in prison, and by whom released?

What optical instruments was he acquainted with?

At what time did Alfred the great reign?

How did he spend the first years of his life?

What was his age at the death of his father?

Did he succeed his father to the throne of England, or did his older brothers come before him?

At what age did he first imbibe a taste for literature?

Was he desirous of coming to the throne, or did he accept of it with reluctance?

Who were the most formidable enemies he had to contend with?

What course did he take when unable to sustain himself against his enemies?

In what respects are colleges anti-republican in their features?

Have Academies any anti-republican features, and what?

Do High schools extend their benefits alike to all, or are they confined to a small portion of the community?

In what respects are common public schools limited in the extension of their blessings?

Are most associations for mutual improvement, republican or anti-republican in their tendency?

In what respects are Lyceums more republican than any other institution?

Who was the author of the system or polity now in use by the methodists for the extension of the gospel?

What are some of the principles and features of that system, which gives it power and harmony in its operations?

What are the smallest or microscopic animals called?

Where is Fingal's cave, and what are its dimensions?

What is the most universal chemical agent in the material world?

What substance next to heat is the most universal and the most active?

Which metal is most universally diffused and most useful?

Of what does hydrogen constitute a part? also carbon?

What are the simple combustibles?

In what substance is carbon found in a pure state?

What facilities are enjoyed in the western valley for the establishment of Lyceum Seminaries?

What are some of the most remarkable animals among the feathered tribe?

What is remarkable in the structure of birds?

For what situation and life is the Ostrich designed?

How many modes of moving from place to place have birds, and what are they?

Is the construction of the wings of birds calculated for strength, or are they weak?

With what means are birds provided for digesting their food?

What habits among birds require great patience?

What measures do different kinds of birds take to preserve themselves and young?

What is there remarkable in the emigration of birds?